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Monitoring and mentoring strategies for diffusing sustainability in supply networks

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Monitoring and Mentoring Strategies for Diffusing Sustainability in Supply Networks

ABSTRACT

Purpose – This paper investigates the impact of monitoring and mentoring strategies on sustainability diffusion within supply networks through focal companies and how suppliers engage in implementing these strategies.

Design/methodology/approach – The paper reports on three in-depth case studies conducted with focal companies and their suppliers. An interaction approach was adopted to guide the analysis of focal companies' strategies for implementing and diffusing sustainability in supply networks.

Findings – The monitoring strategy impacts sustainability diffusion at the dyadic level, while the mentoring strategy is a prerequisite for the diffusion of sustainability at the supply network level. The findings suggest that coupling monitoring with mentoring can lead to diffusion beyond first-tier suppliers. Interaction intensity, supplier proactiveness and mindset change facilitate sustainability diffusion in supply networks.

Research limitations/implications – We suggest more research be conducted on specific practices within monitoring and mentoring, as some of these imply very different levels of commitment and interaction.

Practical implications – The paper suggests that in the future, companies will be increasingly called upon to adopt cooperative initiatives to enable the diffusion of sustainability in supply networks.

Originality/value – The contribution of the paper lies in its identification of the impacts of monitoring and mentoring strategies on the diffusion of sustainability in networks, revealing different supplier engagement in these strategies, which may foster or hinder sustainability diffusion.

Keywords – Sustainability, Diffusion, Monitoring, Mentoring, Supply Network

Paper type – Research Paper

INTRODUCTION

Recent research suggests that companies should improve not only their own sustainability performance, or those of first-tier suppliers, but also their extended supply networks because sustainability problems frequently arise from these sub-tier suppliers (Awaysheh and Klassen, 2010; Meinschmidt *et al.*, 2018). While considerable research on sustainable supply chain management (SSCM) has been devoted to this challenge, fewer studies have investigated how sustainability can be diffused beyond direct (first-tier) suppliers into wider supply networks (Meqdadi *et al.*, 2017; Miemczyk *et al.*, 2012; Sauer and Seuring, 2018; Tachizawa and Wong, 2014; Wilhelm *et al.*, 2016).

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3 However, a growing body of research suggests that more and more companies are launching
4 a range of activities to improve suppliers' sustainability performance and enhance sustainability
5 in their supply networks (Bowen *et al.*, 2001; Gimenez and Tachizawa, 2012; Vachon and Klassen,
6 2006). At the basic level, these activities are designed to control supplier sustainability compliance
7 and ensure no illegality. This is often labelled as a control or monitoring strategy (Lee and Klassen,
8 2008; Vachon and Klassen, 2006). Alternatively, companies can aim to improve their suppliers'
9 sustainability performance through collaboration and support suppliers in their efforts to
10 implement sustainability (Seuring and Müller, 2008; Vachon and Klassen, 2006). This has been
11 described as a collaborative or mentoring strategy and focuses on helping proactively change
12 supplier mindsets and behaviour (Gimenez and Tachizawa, 2012; Holt, 2004). Various other ways
13 for companies to diffuse sustainability to their suppliers exist, such as selecting sustainable (or
14 'green') suppliers or joint development projects with suppliers (Akhavan and Beckman, 2017). We
15 decided to focus on monitoring and mentoring strategies as they encompass several practices for
16 improving supplier sustainability performance that specifically target sustainability diffusion to
17 lower tiers in supply networks.
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22 Most studies related to monitoring and mentoring strategies, however, remain largely
23 conceptual and lack empirical testing of their applicability and effectiveness (Harms *et al.*, 2012).
24 Moreover, these rare empirical studies rely predominantly on data from focal firms, disregarding
25 the suppliers' perspective. This gap is palpable in several studies, such as those on the impact of
26 green supply chain practices on improving environmental performance that exclude suppliers'
27 views on implementing these practices (Bowen *et al.*, 2001; Harms *et al.*, 2012; Holt, 2004). It
28 seems to be taken for granted that suppliers will carry out the demands of focal firms and transmit
29 them to their own suppliers, thereby ensuring the diffusion of sustainability throughout entire
30 supply networks. Ignoring insights from suppliers limits the depth of our understanding of if and
31 how strategies employed by focal firms truly diffuse sustainability.
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36 In order to advance the field, it is necessary to explore the impact of monitoring and mentoring
37 strategies on diffusing sustainability in supply networks, how suppliers perceive the sustainability
38 initiatives being imposed upon them by their customers and how they engage in such initiatives,
39 for example, by embracing or fighting them. This paper therefore investigates the following
40 research question:
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42
43 *What is the impact of monitoring and mentoring strategies on diffusing sustainability within*
44 *supply networks, and how do suppliers engage with these strategies?*
45

46 In this paper, we focus on supply networks rather than supply chains in order to specifically
47 investigate the upstream portion of supply chains. A network perspective has the added
48 advantage of emphasising the complex, interconnected nature of supply chains (Carter *et al.*,
49 2015; Gadde and Håkansson, 2001) and permits further understanding of the embedded context
50 of dyadic relationships (Håkansson, 1982). We adopted the interaction approach developed by
51 the Industrial Marketing and Purchasing (IMP) group (Håkansson and Snehota, 1995). This
52 theoretical lens emphasises *interaction* amongst network actors, meaning that the success of
53 supply network change is dependent on the actions and reactions of the network actors involved
54 in continuous exchange relationships. Hence, suppliers are not seen as passive recipients of
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sustainability initiatives launched by other (focal) network actors but as involved participants in these relationships and networks. We use the interaction approach to study the diffusion of sustainability as a process of change in supply networks through these relationships' interconnectedness, their role as conduits in sustainability diffusion and different actor responses to sustainability strategies (Johnsen *et al.*, 2017; Meqdadi *et al.*, 2019; Tate *et al.*, 2013).

Our study contributes to the existing literatures of SSCM and the IMP interaction approach by elucidating, through empirical evidence from in-depth case studies, the diffusion of monitoring and mentoring practices of companies into supply network, as well as supplier responses to and engagement in focal firms' use of monitoring and mentoring strategies.

LITERATURE REVIEW: SUSTAINABLE SUPPLY NETWORK STRATEGIES

Companies adopt several strategies in order to involve suppliers in sustainability, as shown in Table 1. These strategies are operationalised through practices that sometimes require little interaction with suppliers, such as supplier audits or codes of conduct, or require intensive interaction, such as training programmes or the joint development of sustainable products or processes.

[INSERT TABLE 1 HERE]

The strategies adopted by companies for engaging suppliers in sustainability in many ways resemble traditional supplier assessment and development, which aims to make improvements within supplier operations and performance (Krause *et al.*, 2007). Therefore, the literature related to supplier assessment and development forms a suitable base for SSCM studies. Krause and Ellram (1997) defined supplier development as 'any effort of a buying firm with its supplier(s) to increase the performance and/or capabilities of the supplier and meet the buying firm's short- and/or long-term supply needs' (p. 21). They suggested that supplier development activities be 'remedial' for achieving short-term goals or 'strategic' for building up supplier capabilities. Building on this definition of supplier development, we can distinguish between two strategies for diffusing sustainability: monitoring and mentoring. The following discussion focuses on defining these two strategies and reviewing the existing research on their impacts on sustainability diffusion within supply networks.

Monitoring Strategy

The monitoring strategy can be defined as the set of activities that a focal company launches to control and assess a supplier's sustainability performance. The scope of this strategy intersects with established strategies (Table 1), including 'assessment' (Gimenez and Tachizawa, 2012; Lamming and Hampson, 1996; Ni and Sun, 2018), 'environmental monitoring' (Vachon, 2007; Vachon and Klassen, 2006), 'supplier evaluation and monitoring' (Rao and Holt, 2005) and 'supplier management for risk and performance' (Seuring and Müller, 2008). Typically, monitoring is implemented in response to company's concern about supplier noncompliance with certain sustainability requirements. Accordingly, formal procedures can be used to force suppliers to engage in sustainability and improve their sustainability performance. For example, the company

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3 can gather information on suppliers' sustainability performance by conducting audits (Jiang,
4 2009; Kauppi and Hannibal, 2017; Zhu *et al.*, 2005), questionnaires (Bowen *et al.*, 2001; Harms *et*
5 *al.*, 2012; Seuring and Müller, 2008; Spence and Bourlakis, 2009) or search in public records for
6 information on suppliers' sustainability performance (Vachon and Klassen, 2006). Codes of
7 conduct, which represent a company's values and principles towards sustainability, can also be
8 used as a tool, requiring that suppliers abide by their contents (Boyd *et al.*, 2007; Harms *et al.*,
9 2012; Seuring and Müller, 2008; Vachon and Klassen, 2006). In some instances, the company may
10 ask suppliers to develop and/or certify sustainability management sustainability management
11 systems (Bowen *et al.*, 2001; Seuring and Müller, 2008; Vachon and Klassen, 2006).
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15 In applying a monitoring strategy, companies expect suppliers to reach a certain sustainability
16 level; suppliers who fail to comply with sustainability requirements may face penalties (Cousins
17 *et al.*, 2004), such as business volume reduction or relationship termination, while those who
18 successfully comply may earn rewards, such as gaining more business volume or moving to
19 preferred supplier list, for their outstanding sustainability performance (Bowen *et al.*, 2001;
20 Cousins *et al.*, 2004; Jiang, 2009). However, the effectiveness of monitoring has been questioned.
21 For example, Vachon (2007) pointed to several shortcomings, including uncertainty over actual
22 supplier sustainability behaviour, the difficulty of verifying monitoring outcomes as a result of
23 green washing behaviour and limited potential for improving or developing sustainable products
24 and processes. Overall, the monitoring strategy focuses on forcing suppliers to comply with the
25 required sustainability standards and policies set out by the focal firm.
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29 *Mentoring Strategy*

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32 The mentoring strategy comprises a set of activities that a focal company launches to upgrade
33 supplier sustainability capability on a long-term basis. Capability refers to a company's possession
34 of internal and external resources and competencies to meet the requirements of a changing
35 environment (Teece *et al.*, 1997). Hence, sustainability capability can be seen as an actors'
36 possession of resources, skills and competencies that may facilitate sustainability implementation
37 within and outside their borders, as well as the company's mentoring strategy aims at building
38 such supplier capabilities for the long-term (Krause and Ellram, 1997).
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41 Related to mentoring are the terms 'environmental collaboration' (Seuring and Müller, 2008;
42 Vachon and Klassen, 2006), 'collaboration approach' (Gimenez and Tachizawa, 2012; Lamming
43 and Hampson, 1996; Ni and Sun, 2018), 'partnership' (Geffen and Rothenberg), 'product-based
44 green supply' (Bowen *et al.*, 2001) and 'support-based' (Lee and Klassen, 2008). The mentoring
45 strategy is based on the focal company's direct engagement with suppliers in activities to jointly
46 improve suppliers' sustainability performance (Ni and Sun, 2018). A collaborative atmosphere is
47 at the heart of this strategy (Harms *et al.*, 2012).
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51 Under the mentoring strategy, the focal company dedicates considerable resources to
52 conducting activities such as training, educating suppliers on sustainability (Cousins *et al.*, 2004;
53 Gimenez and Tachizawa, 2012; Harms *et al.*, 2012; Tachizawa and Wong, 2014) and offering
54 seminars on sustainability (Rao and Holt, 2005; Lee and Klassen, 2008). Other activities include
55 exchanging sustainability knowledge and expertise with suppliers (Holt, 2004; Rao and Holt, 2005;
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Seuring and Müller, 2008; Vachon and Klassen, 2006), interacting closely with suppliers to solve sustainability problems (Geffen and Rothenberg, 2000; Lee and Klassen, 2008; Vachon and Klassen, 2006) and providing financial support to suppliers to improve their sustainability performance (Zhu *et al.*, 2005). Table 2 provides a summary of the main practices associated with the monitoring and mentoring strategies.

[INSERT TABLE 2 HERE]

SUSTAINABILITY DIFFUSION IN SUPPLY NETWORKS

Supplier Perspective on Diffusing Sustainability

The importance of considering the suppliers' side when a focal firm seeks to impose sustainability requirements has been highlighted in a few recent studies. For example, Wilhelm *et al.* (2016) explored the contingency factors, such as incentives and information transparency, and institutional factors, such as customer and regulatory pressures, and concluded that they had positive impact on the ability of first-tier suppliers to transmit sustainability requirements of customers to second-tier suppliers. Meqdadi *et al.* (2017) focused on the role of power and trust in diffusing sustainability into supply networks, and Meinschmidt *et al.* (2018) explored contextual pressures in terms of environmental and behavioural uncertainty and asset specificity. These studies reached varied conclusions, but all suggested that diffusing sustainability requirements into supply networks is largely dependent on the proactiveness of direct suppliers to transmit sustainability to sub-tier suppliers.

The majority of studies on monitoring and mentoring strategies have focused on the focal (customer) firm and only exceptionally considered supplier perspectives. However, the few studies on supplier perspectives reveal the other side of the coin and how suppliers might not willingly embrace focal firm sustainability initiatives. Jiang (2009) argued that suppliers' compliance to customers' codes of conduct is not guaranteed, especially for overseas suppliers, and enforcement of codes of conduct on suppliers through an arm's-length approach may not result in ensuring compliance. Boyd *et al.* (2007) argued that high monitoring levels of suppliers may negatively affect relationships between the company and suppliers, as it tends to foster adversarial rather than collaborative relationships. While this strategy may be suitable for large and complex supply networks (Awaysheh and Klassen, 2010; Vachon and Klassen 2006), the nature of the activities within the monitoring strategy offers only a short-term and static view of suppliers' sustainability situations. In comparison, Lee and Klassen (2008) argued that the mentoring strategy fosters long-term supplier capabilities to improve sustainability rather than solely focusing on immediate results. Overall, this body of research points to the importance of supplier engagement as a prerequisite for successful sustainability diffusion.

Supplier Engagement

Sustainability requires synergy from multiple supply network actors, as Carter and Rogers (2008) stressed in their definition of SSCM. This implies that interaction amongst multiple actors is required for sustainability diffusion in supply networks. Our research seeks to understand not

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3 only how a focal firm actively imposes its sustainability initiatives on passive suppliers but also
4 how focal firms and their suppliers *interact* in order for sustainability to diffuse successfully across
5 supply networks. Based on the interaction approach (Håkansson and Snehota, 1995), our premise
6 maintains that sustainability diffusion can be realised through monitoring and mentoring
7 strategies, but the impact of these strategies depends on suppliers' responses (Harrison and
8 Easton, 2002), their proactiveness to engage in focal firm initiatives and the diffusion of
9 sustainability initiatives into their own supplier relationships. This means that for suppliers to
10 engage in the sustainability initiatives proposed or required by their customers, they may have to
11 make changes to their activities and resources and, in the long term, institutionalise changes
12 instigated by the customer (focal firm). Furthermore, from a supply network perspective, a
13 'network change' is generated (Halinen *et al.*, 1999) and diffusion of sustainability in the supply
14 network takes place only if such changes in the customer-supplier dyad also influence other actors
15 (i.e. change is connected).
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20 However, actors may oppose and resist change, especially if it is unique and not applicable to
21 other relationships, thereby creating an inertia to keep the relationship stable (Havila and Salmi,
22 2000). To negate this, engaging the supplier is needed, and in the context of sustainability, this
23 may include changes, for example, in their physical resources, knowledge-based capabilities
24 (Bowen *et al.*, 2001; Lee and Klassen, 2008) and internal processes, such as production processes
25 or sourcing strategies and practices (Bowen *et al.*, 2001; Paulraj, 2011). When companies use a
26 mentoring strategy to develop a sustainable supply network, they specifically aim to change
27 supplier sustainability capabilities, including how they manage their own suppliers, thus inducing
28 a supply network change.
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32 A review of monitoring and mentoring strategies for diffusing sustainability in supply networks
33 shows that extensive research exists on how these strategies can be implemented. Recent
34 research emphasises the importance of engaging suppliers in the diffusing process, as diffusion
35 takes place through supplier relationships. This implies a need to understand focal firm
36 sustainability diffusion from an interaction perspective (Johnsen *et al.*, 2017) in order to unpack
37 not only the focal firms' perspective of how they apply sustainability monitoring and mentoring
38 strategies but also how suppliers implement these strategies beyond their borders. Our research,
39 therefore, sets out to study the impact of monitoring and mentoring strategies, as manifested
40 through specific practices on diffusing sustainability into supply network, and reveal whether
41 supplier engagement in these practices may foster or hinder sustainability diffusion to sub-tier
42 suppliers.
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46 **METHODOLOGY**

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48 Although case studies have been perceived as a way to *build* theory (Eisenhardt, 1989), we seek
49 to use case studies to *elaborate* theory (Ketokivi and Choi, 2014). Our approach to case studies
50 follows the guidelines of Dubois and Gadde (2002), which emphasise systematic combining and
51 storytelling more so than construct design (see also Dyer and Wilkins, 1991). Our paper is based
52 on case studies that allowed us to capture various monitoring and mentoring practices initiated
53 by companies with their first-tier suppliers and revealing suppliers' stances toward adopting and
54 transmitting these practices further along the supply network. We set out to collect data from
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sets of focal firms and suppliers to understand their perspectives, assuming that each would have different perspective rather than any shared view of reality.

Case Selection

We adopted a multiple in-depth case study design to discern the similarities and contrasts among the cases (Ellram, 1996). We targeted companies from different yet comparable industries to ensure consistency within contexts and results. We sought leading European companies in their industries that are listed on sustainability indices, such as the Dow Jones Sustainability Index (DJSI). The targeted companies have launched social and environmental initiatives that crossed their organisational boundaries and involved at least their first-tier suppliers. After contacting several companies, we secured the agreement of three to participate in our research. We reviewed the companies' websites, annual reports and sustainability reports to ensure they fulfilled our criteria.

The three focal companies belong to metal, pharmaceutical and chemical industries, where the three companies operate in both industrial and consumer markets, and are thus all subject to similar, strict governmental regulations and scrutiny from the media. The first company is involved in producing refined precious metals (hereafter called Metal), the second produces pharmaceutical products (Pharma) and the third produces coating materials for various applications and industries (Coating). The true identity of the companies, as well as their suppliers, is disguised in this study, as we assured them of their anonymity in any type of publication. This encouraged the interviewees to discuss openly their views on customers' sustainability practices.

We identified the suppliers of the companies through snowball sampling, where focal company interviewees identified those suppliers who participated in their sustainability initiatives and provided their contact information. We decided to contact three to five suppliers for each company and focused on suppliers that are medium to large in size and are considered important to the focal companies in terms of total expenditure or the importance of the products or materials provided. An overview of the companies and suppliers is provided in Appendix 1.

Data Collection

The unit of analysis in this study was a set of sustainability initiatives launched by the focal companies. Defining our unit of analysis in this way enabled us to discern the strategies adopted by the focal companies for diffusing sustainability in their supply networks and then to select the suppliers involved in these initiatives.

We collected data through two sequential stages. In the first stage, we visited the premises of the focal companies and conducted interviews with people involved in sustainability initiatives such as sustainability director, procurement director, supply chain director and head of production. This stage of interviews was crucial for understanding how sustainability was managed by the focal companies, their sustainability strategies and initiatives launched in their own supply networks and identifying participating suppliers. In the second stage, we conducted

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3 interviews with the selected first-tier suppliers to learn more about their views regarding the
4 impact of the focal companies' sustainability initiatives on their own sustainability performance,
5 identify their implementation of the sustainability practices and how they sought to diffuse
6 sustainability to their own suppliers. We interviewed people within the first-tier suppliers who
7 were responsible for implementing the focal companies' sustainability practices and occupied a
8 senior position in their companies, such as a managing director, sales director or sustainability
9 director.
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13 The interview protocol was designed to question the focal companies and suppliers about their
14 involvement in sustainability, the response of suppliers to the focal companies' sustainability
15 practices and their diffusion within the supply networks. At the beginning of each interview,
16 interviewees were asked about their understanding of sustainability and, based on the definition
17 of SSCM provided by Carter and Rogers (2008), we explained that the interview questions would
18 cover both environmental and social aspects of sustainability. This ensured interviewees' uniform
19 understanding of the scope of sustainability within our research. The interviewees were asked
20 about the changes they implemented to facilitate sustainability practices. This consisted of, for
21 example, questions on the modifications they made to production processes, product features,
22 logistical activities, planning procedures and if the modifications required financial investment.
23 Although we were unable to interview second-tier suppliers, the interview protocol assisted in
24 revealing the impact of monitoring and mentoring strategies of the focal firms on the first-tier
25 suppliers and if sustainability diffused to second-tier suppliers.
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30 All interviews were semi-structured and conducted face-to-face at the company or supplier
31 site or via telephone when it was difficult to travel and reach the interviewee (especially for
32 suppliers located in Asia and the United States). Interview questions were sent in advance to the
33 interviewees, which allowed them to prepare and find additional materials to support their
34 answers during the interviews. The interviews typically lasted 45–60 minutes, and in some cases
35 more than three hours. In total, 32 interviews were conducted; 18 and 13 with the focal
36 companies and suppliers, respectively. An interview was also conducted with a sustainability
37 auditing company (SA) who was nominated by both Metal and Pharma for auditing their suppliers.
38 This interview assisted us to have better understanding on the impact of the sustainability audits
39 on improving the suppliers' sustainability performance. Appendix 1 provides details on the
40 interviews and interviewees with the companies and their suppliers.
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44 Interviewees from both the focal companies and suppliers also provided us with sustainability
45 reports, PowerPoint presentations on special sustainability issues, sustainability audit reports, life
46 cycle analysis (LCA) reports, organisational charts and sustainability tools. These secondary
47 sources were helpful in acquiring more understanding of the companies' strategies for diffusing
48 sustainability in supply networks.
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51 *Data Analysis*

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53 We followed Miles *et al.*'s (2014) recommendation for coding the collected data. The process was
54 conducted manually by reading the interview transcripts and assigning codes to chunks of the
55 data. The coding process was conducted by the two leading authors independently and several
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meetings were held to discuss the codes and their interpretations. The codes were then categorised by linking them to the constructs of the study, such as sustainability practices, strategies, supplier modifications and sustainability diffusion to sub-tier suppliers. Therefore, the coding process was iterative and grounded in qualitative data but took into consideration key concepts from the literature (Ketokivi and Choi, 2014). The independent coding, discussion for each coding step and code categorisation were instrumental in reducing bias in the coding process and ensuring high inter-rater reliability (Voss *et al.*, 2002).

The analysis process was conducted on two levels (Miles *et al.*, 2014): case and cross-case. Within-case analysis revealed the sustainability initiatives launched by the focal companies and suppliers. This helped identify the strategies adopted in each case, suppliers' changes to implement them and their impact on diffusing sustainability. The results were displayed in tables, which facilitated conducting the next level of analysis, cross-case, which aimed to detect the similarities and differences between the cases (Miles *et al.*, 2014) and accordingly, discern the impact of monitoring and mentoring practices on diffusing sustainability in supply networks.

The validity of our research was achieved through collecting data from companies, suppliers and secondary sources. Inter-rater reliability was ensured through independent double coding (Voss *et al.*, 2002), and we returned summary reports to the focal companies and suppliers to verify our interpretations of the findings (Ellram, 1996). Follow-up emails or telephone calls were conducted wherever needed to obtain additional information or to clarify areas of ambiguity.

WITHIN-CASE ANALYSIS

This section details how the focal companies implemented monitoring and mentoring strategies with their first-tier suppliers. Sustainability diffusion is investigated in two stages. First, we focus on the impact of monitoring and mentoring strategies on diffusing sustainability in the focal companies' supply networks. Second, we investigate how first-tier suppliers engaged in these strategies and sought to implement sustainability practices in second-tier suppliers and beyond.

Metal's Strategy for Sustainability Diffusion in Supply Network

Metal is a multinational company based in Europe that focuses on materials technology and recycling. The company specialises in automotive catalysts and speciality materials, such as cobalt, zinc and platinum. Due to the pressure from different stakeholders, such as society, nongovernmental organizations (NGOs), the media and government, to improve the company's sustainability performance, Metal launched several initiatives, including a supplier monitoring strategy:

'I think it's important when you look at sustainability, part of it is to reduce your risks for sure, to protect your reputation and image.' (Metal, Vice President of Purchasing)

The monitoring strategy was implemented through practices such as asking suppliers to sign and abide by a sustainable procurement charter derived from Metal's code of conduct. Metal also conducted intensive sustainability audits through the third-party SA, covering both environmental and social aspects of sustainability. Additionally, the company asked suppliers to

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3 report their CO₂ emission levels and their factories' health, safety and environment (HSE)
4 conditions. Table 3 illustrates Metal's monitoring strategy and suppliers' engagement in them.
5

6 While Metal believed that its monitoring practices were helpful in improving suppliers'
7 sustainability performance and reducing sustainability risks, the perceptions of suppliers on these
8 practices provided additional insights. The suppliers expressed differing opinions on the impact
9 of Metal's monitoring strategy. MS1 and MS2 applauded the sustainability audits by SA, as it
10 assisted them in establishing systems to deal with sustainability and achieve the required scores:
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14 'So [third party auditing] is something we are doing because sometimes it is written there but not really in a
15 programme. It needs to be ... systematic ... and it is helping us indeed.' (MS1)
16

17 The sustainability capability that MS1 and MS2 gained through this process enabled them to
18 respond to other customers' requests for sustainability. However, MS3 and MS4 participated only
19 by signing the sustainable procurement charter and reporting on their CO₂ emissions and HSE
20 conditions. Metal justified the limited engagement of these two suppliers by pointing to the low
21 risk they represented, feeling there was therefore no need to subject them to sustainability
22 audits. MS3 and MS4 indicated that their awareness of sustainability had increased but that it
23 induced little impact beyond this:
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27 'From my perspective, such an approach is theoretically good but in practice there is no leverage on the
28 expected results that we want.' (MS4)
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30 Metal's monitoring strategy impact was, therefore, insufficient in equipping the suppliers with
31 the knowledge and expertise needed to initiate activities with second-tier suppliers. However,
32 the suppliers were not in a position to embark on such activity anyway:
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34
35 'No, not yet, we have not reached this stage [transmitting sustainability practices to second-tier suppliers] and
36 it is not required by Metal.' (MS3)
37

38 By engaging in Metal's sustainability practices, suppliers MS1 and MS2 had to build their own
39 sustainability management systems. They had to adapt and devise procedures for HSE issues,
40 such as waste disposal and materials spillage control. These changes did not require significant
41 financial investment by the two suppliers. The four suppliers engaged in sustainability reporting
42 and signed Metal's code of conduct. Accordingly, they made minor changes to regularly report on
43 their sustainability performance. However, the suppliers indicated that Metal imposed its
44 sustainability requirements in a forceful way with little interaction or guidance on how to achieve
45 them:
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49 'We provide our CO₂ emission management, so it's more the purchase manager who asks us to answer specific
50 questions, but it's not in an interactive manner ... it's more in a pushy way.' (MS4)
51

52 These suppliers effectively had to respond to Metal's sustainability requirements to maintain
53 the relationship and remain on Metal's preferred list of suppliers. From Metal's side, there were
54 no direct rewards or incentives to encourage the suppliers to engage in its sustainability practices.
55 In fact, we observed the four suppliers taking a reactive stance, focusing on simply complying with
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3 Metal's monitoring strategy with no attempts to transmit the monitoring practices to second-tier
4 suppliers.
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7 Overall, the suppliers made relatively minor changes that included establishing systems to
8 manage sustainability or modifying HSE procedures; these required no significant investments.
9 The level of interaction between Metal and the suppliers was low, and the suppliers were reactive
10 to Metal's monitoring strategy. Hence, Metal's sustainability implementation remained confined
11 within the boundaries of the suppliers, as shown in Table 3.
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13 *Pharma's Strategies for Sustainability Diffusion in Supply Network*

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16 Pharma is a leading pharmaceutical company based in Europe and headquartered in the US. The
17 company produces medicines such as neurosciences, pain relief and vaccines. Pharma's credo,
18 that focuses on sustainability, influenced the company to launch several initiatives to improve
19 sustainability in its supply network. Pharma adopted both monitoring and mentoring strategies
20 for engaging suppliers in sustainability in order to improve its reputation and build a sustainable
21 supply network. The purpose of the monitoring strategy was to detect suppliers posing
22 sustainability risks and then decide on the appropriate action to improve their sustainability,
23 while the mentoring strategy aimed at building the suppliers' sustainability capabilities. Table 3
24 shows Pharma's monitoring and mentoring strategies for four suppliers (PS1, PS2, PS3 and PS4).
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28 The suppliers' perceptions revealed the impact of Pharma's monitoring and mentoring
29 strategies. The monitoring practices were perceived as essential by suppliers PS1, PS2 and PS3 to
30 building internal sustainability capabilities. In particular, sustainability reporting, risk assessment
31 and assessment questionnaires brought areas that needed improvement to the suppliers'
32 attention, such as CO₂ emissions and safety management within their factories. The sustainability
33 audits motivated them to improve their sustainability performance to gain better evaluation and
34 scores. The auditing process conducted by the third-party SA was intensive and covered a range
35 of environmental and social issues. Sustainability rewards, such as gaining more business or
36 better treatment from the procurement function, represented a motivating factor for the
37 suppliers to strive for improving their sustainability performance.
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41 PS1, PS2 and PS3 appreciated Pharma's monitoring strategy, as it enabled them to improve
42 their sustainability performance. To comply with Pharma's monitoring practices, they had to build
43 sustainability management systems and modify their reporting procedures to comply with
44 Pharma's requirements. The fourth supplier, PS4, already had a system for sustainability reporting
45 that management developed internally to respond to customer requests for sustainability
46 improvement. PS4 was required to report its CO₂ emission, HSE conditions and participate in the
47 sustainability auditing. Thus, the four suppliers made minor changes, for example, to their
48 production processes, machines or product features in order to implement Pharma's monitoring
49 strategy.
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53 Engaging PS1, PS2 and PS3 in Pharma's mentoring strategy required making significant changes
54 to supplier factories and production processes. Mentoring had a profound impact on PS1, PS2
55 and PS3 in terms of providing them with the knowledge and capabilities needed to embark on
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3 activities aimed at improving the sustainability performance of second-tier suppliers. The
4 suppliers explained that sustainability tools (sustainability ladder), sustainability conferences and
5 training enhanced their sustainability capabilities not only within their companies but also with
6 second-tier suppliers. On-site visits represented an opportunity for both Pharma and the suppliers
7 to explore the sustainability problems and how to mitigate these through sustainability
8 knowledge exchange. All three suppliers made changes in their plants, such as installing devices
9 and respiratory systems to reduce, for example, CO₂ emission, solvent consumption, materials
10 spillage and waste, and installed water purification systems and improved worker health and
11 safety conditions through personal protective equipment (PPE). Therefore, PS1, PS2 and PS3
12 made major changes to their production processes and machines that required financial
13 investment.
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18 Pharma's mentoring practices had a profound impact on enhancing the suppliers'
19 sustainability capabilities and they, in turn, were able to implement these practices further with
20 second-tier suppliers (Table 5). For example, PS1, PS2 and PS3 requested that second-tier
21 suppliers report on sustainability, build sustainability management systems, sent these suppliers
22 questionnaires and conducted sustainability risk assessment. We also observed that PS1, PS2 and
23 PS3 implemented some of Pharma's mentoring practices with second-tier suppliers. For example,
24 they made on-site visits (PS1 and PS3), organised sustainability conferences (PS1), training (PS1
25 and PS2) and exchanged sustainability tools and knowledge. Thus, the combined monitoring and
26 mentoring practices of Pharma diffused sustainability to second-tier suppliers through first-tier
27 suppliers. This diffusion was thanks in part to Pharma's mentoring strategy:
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31 'We benefit from the support from Pharma and ... if we want to do a good job, we need support from other
32 customers and also from suppliers. In the same way, we need to help our suppliers, provide certain training
33 or support to them. If you just work on papers or simple requirements, as [in] you have to do this and that, it
34 is difficult for sustainability to happen. It's not sustainable.' (PS3)
35

36 At the time of conducting the interviews, Pharma engaged PS4 in monitoring and would decide
37 later if there was a need for mentoring. PS4 explained that its main concern was complying with
38 Pharma's requirements under the monitoring strategy and they did not have the capability to
39 convey Pharma's sustainability requirements to second-tier suppliers:
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42 'We don't communicate Pharma's requirements to our suppliers, we haven't done it yet. It is not applicable.'
43 (PS4)
44

45 The findings in this case study point to the impact of applying both monitoring and mentoring
46 strategies. The monitoring strategy impacted the suppliers PS1, PS2 and PS3 by developing their
47 own capabilities and skills to manage sustainability. Exceptionally, the supplier PS4 had
48 individually developed these capabilities for other customers. The four suppliers believed that
49 monitoring alone did not provide them with the capabilities needed to convey sustainability
50 requirements to second-tier suppliers and sustainability diffusion therefore remained confined to
51 the dyadic level. In contrast, Pharma's mentoring strategy impacted PS1, PS2 and PS3, enabling
52 them to diffuse sustainability beyond their boundaries by enhancing the first-tier suppliers'
53 capabilities to engage second-tier suppliers in Pharma's sustainability practices (Table 3). The
54 mentoring strategy required high level of interaction between Pharma and PS1, PS2 and PS3 as
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3 the suppliers had to make major changes to their production processes and machines that
4 involved significant financial investment. We observed also a synergy between monitoring and
5 mentoring, as these strategies reinforced one another and led to diffusing monitoring practices
6 to second-tier suppliers.
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8 9 *Coating's Strategies for Sustainability Diffusion in Supply Network*

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11 Coating is a global company headquartered in Europe that operates in markets across Asia,
12 Europe and the US. The company specialises in producing speciality coating chemicals that are
13 used in industries such as automotive, aerospace and construction. Coating aims to protect its
14 reputation and build a sustainable supply network to support its business strategy based on
15 expansion and growth in Asian markets. Thus, the company launched initiatives to improve
16 sustainability performance in its supply network, including supplier monitoring and mentoring
17 practices (see Table 3).
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21 Monitoring was done through a code of conduct that suppliers were required to comply with.
22 This monitoring practice involved three suppliers: CS1, CS2 and CS3 and had an almost negligible
23 impact on improving their sustainability performance. Coating justified its engagement in this
24 monitoring practice:
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27 'Legally, we are covered. In the new economy, we don't have to visit [the] factories of those suppliers because
28 those suppliers are responsible, from an ethical point of view, to keep and maintain a standard that is
29 acceptable.' (Coating, Procurement Director).
30

31 Coating's mentoring strategy also involved these three suppliers and included on-site visits to
32 the suppliers' premises to educate them on environmental and social practices, solve specific HSE
33 problems and coach them in the use of sustainability tools to enhance their sustainability
34 capability. The tools consisted of documents, manuals and procedures. Coating also held
35 conferences on HSE, using these as an opportunity to share sustainability knowledge with
36 suppliers.
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39 The three suppliers emphasised the impact of Coating's mentoring activities in enhancing their
40 sustainability capabilities. The mentoring strategy endowed them with sustainability knowledge
41 and skills, enabling them to engage with second-tier suppliers for improving sustainability. For
42 example, the three suppliers made on-site visits to second-tier suppliers to evaluate sustainability
43 conditions, exchange sustainability knowledge, train and help implement sustainability tools,
44 such as LCA analysis, and gather information on the sustainability performance of third-tier
45 suppliers, i.e. farmers who supplied agricultural materials (palm oil and grapeseed) for the
46 production of the renewable materials to second-tier suppliers:
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50 'We have to get raw materials for producing bio-product as per their [Coating] sustainability requirements.
51 For example, we asked suppliers to provide their CO₂ emissions and asked for their adherence to procuring
52 the raw materials from sustainable sources. In principle, we have a programme in place internally where we
53 want to convert as much as possible into sustainable product line. We make sure we get supplied with
54 sustainable materials.' (CS3)
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3 In terms of engagement, the three suppliers made no changes to implement Coating's
4 monitoring strategy, but they had to make major changes as part of the mentoring activity. For
5 example, they had to improve HSE conditions in factories by installing devices and systems to
6 reduce gas emissions from the chemical processes and provide workers with PPEs to improve
7 health and safety conditions. These changes required financial investment by the suppliers. A
8 major change also involved modifying their chemical production processes to accommodate
9 renewable materials, as required by Coating, while continuing the production of petrochemical-
10 based products for other customers. That necessitated modifications in logistics activities
11 (transportation and storage) to obtain renewable materials and modify the production planning
12 system to produce sustainable products. There were no changes to production machines.
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16 This case shows that the monitoring strategy, limited to sending a code of conduct to suppliers,
17 in itself had little impact on suppliers' sustainability capabilities. Sustainability diffusion occurred
18 in Coating's supply network thanks to mentoring that included intensive interactions and major
19 supplier changes. Mentoring resulted in building the first-tier suppliers' sustainability capabilities,
20 who in turn involved second-tier suppliers in sustainability. A high level of interaction was also
21 observed between the first- and second-tier suppliers to implement Coating's sustainability
22 requirements. Table 3 summarises the findings in this case study.
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26 [INSERT TABLE 3 HERE]
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28 **CROSS-CASE ANALYSIS** 29

30 The three case studies demonstrate the impact of monitoring and mentoring strategies on
31 suppliers and the extent of sustainability diffusion across supply networks. Our findings also
32 illustrate the varied engagement of suppliers and their responses to this monitoring and
33 mentoring. Comparing the cases reveals interesting patterns, which are captured in Table 4.
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36 The three focal firms all monitored their suppliers but at different intensities. Monitoring
37 activities focused on ensuring suppliers attained a certain level of sustainability performance and
38 enabling them to develop sustainability within their own organisations; however, they needed
39 additional capabilities to convey sustainability to second-tier suppliers. Therefore, the suppliers
40 were reactive and mostly concerned with achieving the required compliance level, reflected in
41 their minor changes in sustainability management systems and amendments to HSE procedures.
42 Still, we found differences in suppliers' perceptions on how much the monitoring strategy
43 influenced them overall.
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47 In Pharma's case, they first applied monitoring to enable the suppliers to improve their own
48 sustainability performance and then implemented the mentoring strategy, while for Coating, the
49 monitoring strategy caused very little change in the suppliers. In Metal's case, the impact of
50 monitoring practices remained within the suppliers' boundaries. Therefore, in all three cases,
51 when applied on its own (i.e. without a mentoring strategy), the monitoring strategy led to
52 confined sustainability diffusion at dyadic levels (focal companies, first-tier suppliers) but nothing
53 beyond that.
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3 In addition to supplier monitoring, Pharma and Coating engaged in extensive mentoring
4 activities to build sustainability capabilities with suppliers and thereby help them to further
5 diffuse sustainability. These efforts resulted in suppliers developing the capabilities necessary to
6 embark on sustainability practices with their own suppliers. Thus, the suppliers were proactive in
7 adopting and diffusing the focal companies' sustainability requirements within their own
8 organisations and beyond. We found that these strategies could reinforce each other: for Pharma,
9 the focal company carried out several monitoring practices with suppliers, preparing the way for
10 building sustainability capabilities through mentoring activities. This strategy appeared to diffuse
11 to second-tier suppliers, as the focal company coupled monitoring with mentoring activities for
12 first-tier suppliers.
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16 The findings provide insights into the varying levels of interaction between the focal companies
17 and suppliers and the magnitude of changes made by suppliers. They suggest that a high level of
18 interaction was a prerequisite for positive change in suppliers' mindsets and processes.
19 Interactions between Metal and its suppliers were limited by the major monitoring activity,
20 sustainability auditing and being organised and managed by a third party. For Pharma and
21 Coating, intensive interaction between the focal companies and suppliers resulted in major
22 changes in some suppliers' activities and resources. For example, suppliers (except PS4) had to
23 modify their production planning system, transport and storage activities, install respiratory
24 systems to reduce CO₂ emissions and produce sustainable products.
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28 For Coating, where sustainability diffusion was extensive, the findings revealed the complexity
29 of sustainability management, as it crossed several regional boundaries (Europe, Asia and Latin
30 America) and industries (chemical, oil and agriculture). Tackling the sustainability challenge in this
31 case required interaction between many dispersed supply network actors, and the mentoring
32 strategy appeared to play a critical role in facilitating these interactions. Likewise, Pharma
33 perceived interacting with suppliers through mentoring activities as crucial for building a
34 sustainable global supply network:
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38 'We move from monitoring to mentoring, and this is indeed the most important because that is where you
39 are going to make the change. This [monitoring] is changing nothing. This is just monitoring.' (Pharma, Global
40 Sustainability Director)
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42 [INSERT TABLE 4 HERE]
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44 DISCUSSION

45
46 The diffusion of sustainability practices beyond first-tier suppliers is imperative to the modern
47 supply network, as sub-tier suppliers often pose sustainability risks. Thus, our study focused on
48 the impact of sustainability practices under monitoring and mentoring strategies on sustainability
49 diffusion in supply networks. Our study determined that engaging supplier in focal company's
50 monitoring and mentoring strategies is contingent on interaction of supplier with focal company,
51 as well as supplier willingness to commit changes to transmit sustainability practices to sub-tier
52 suppliers. In the following, we discuss the theoretical and managerial implications of our research.
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56 *Coupled Strategy for Sustainability Diffusion in Supply Network*
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3 In our case studies, monitoring practices clearly increased the suppliers' awareness of
4 sustainability but little else. Monitoring through auditing involved more interaction and thus
5 enhanced supplier capabilities but appeared insufficient to engage second-tier suppliers. Overall,
6 our three case studies showed that the impact of monitoring strategies on sustainability diffusion
7 was confined to the dyadic levels with varying impacts on the dyads. This supports previously
8 expressed doubts on whether monitoring yields effective results in terms of suppliers' compliance
9 with sustainability requirements and thereby diffusion within supply networks (Boyd *et al.*, 2007;
10 Gimenez and Tachizawa, 2012; Jiang, 2009). Both Pharma and Coating engaged in mentoring
11 activities with suppliers, endowing them with the necessary sustainability capabilities to diffuse
12 sustainability requirements further into their supply networks. This is in line with the argument
13 of Bowen *et al.* (2001), that developing internal capabilities is essential to implementing supply
14 initiatives. Similarly, Zhu *et al.* (2005) concluded that companies sometimes refrain from engaging
15 in environmental practices due to a lack of proper tools and knowledge.
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20 While implementing monitoring and mentoring strategies for sustainability diffusion to sub-
21 tier suppliers has been discussed in some studies within SSCM literature, our study contributes to
22 SSCM by demonstrating the different impacts of monitoring (confined sustainability diffusion at
23 dyadic level) and mentoring (sustainability diffusion within supply networks). Although several
24 authors argue that monitoring can be a prerequisite for more intensive programmes under a
25 mentoring strategy (Awaysheh and Klassen, 2010; Boyd *et al.*, 2007; Lee and Klassen, 2008), our
26 study shows how monitoring practices can be diffused to sub-tier suppliers. Indeed, when
27 Pharma's suppliers engaged in mentoring, they obtained the capability to monitor second-tier
28 suppliers. Thus, we propose that monitoring practices can be instrumental in the diffusion of
29 sustainability initiatives to sub-tier suppliers, provided that they are coupled with mentoring
30 practices.
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34 *Connected Change for Sustainability Diffusion in Supply Network*

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36 We adopted the interaction approach (Håkansson, 1982; Håkansson and Snehota, 1995) as a
37 theoretical lens to examine how supply network actors interact when they seek to diffuse
38 sustainability beyond first-tier suppliers (dyadic level). The interaction approach suggests that
39 interaction between focal companies and suppliers is a prerequisite for suppliers to make changes
40 to their activities and resources (Halinen *et al.*, 1999). Increasing interaction between focal
41 companies and suppliers can assist in overcoming inertia and lessen suppliers' resistance, thereby
42 connecting the change with the wider supply network rather than confining it to a dyadic
43 relationship (Halinen *et al.*, 1999; Harrison and Easton, 2002; Meqdadi *et al.*, 2017).
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47 The monitoring strategy appeared to be associated with limited interaction between the focal
48 companies and their suppliers: monitoring was imposed on suppliers, for example, where they
49 were obliged to sign a code of conduct document (Metal and Coating) or to submit to
50 sustainability auditing by a third party (Metal and Pharma). The low interaction between the focal
51 companies and suppliers led to little change in the suppliers' mindsets toward propagating the
52 monitoring practices to second-tier suppliers. Thus, the impact of the monitoring practices was
53 minor and limited. In contrast, the mentoring strategy was characterised by intensive interaction
54 between the focal companies (Pharma and Coating) and suppliers, as the main aim was to build
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3 sustainability capabilities that allowed suppliers to convey these activities to sub-tier suppliers.
4 The suppliers were proactive and made major changes that facilitated these goals.
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7 Our study revealed that supplier engagement in the sustainability practices of focal companies
8 is contingent on the interaction and proactiveness of suppliers to undergo major and conscious
9 changes. This led to changing their mindsets, encouraging them to be proactive and play the dual
10 role of recipient and transmitter of the focal company's sustainability requirements. Some studies
11 suggest that mentoring can lead to effective results in diffusing sustainability to suppliers
12 compared with monitoring strategy (Rao and Holt, 2005; Vachon, 2007; Vachon and Klassen,
13 2006). However, our study demonstrates why suppliers take a positive or negative stance towards
14 propagating focal firm sustainability practices to sub-tier suppliers, which is contingent on
15 changing suppliers' mindsets and their willingness to change.
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19 Sustainability remains an under-researched topic within the IMP interaction approach
20 (Johnsen *et al.*, 2017). Our study contributes to this by emphasising the importance of network
21 actors' proactiveness in diffusing sustainability from the dyadic level into supply networks
22 (Meqdadi *et al.*, 2017; Öberg *et al.*, 2012). Several studies hint at the difficulty of managing the
23 sustainability of sub-tier suppliers (e.g. Sauer and Seuring, 2018). Our study points to the
24 usefulness of the IMP interaction approach (e.g. its notion of connections and interaction) in
25 explaining how focal firm sustainability practices can be disseminated into second-tier suppliers
26 through intensive interaction with first-tier suppliers. Interaction between focal firms and their
27 suppliers thus becomes key to sustainability diffusion in supply networks. From a methodological
28 perspective, our research illustrates the value of considering both focal companies' and suppliers'
29 perspectives to obtain a richer understanding of the complexities of diffusing sustainability in
30 supply networks.
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33 34 *Managerial Implications*

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36 Given the current pressure on companies to develop sustainable business practices and supply
37 networks, we advise companies to engage in strategies that not only improve the sustainability
38 compliance and performance of direct first-tier suppliers but also reach indirect sub-tier suppliers.
39 This is crucial, as sustainability non-compliance, which may seriously damage a company's
40 operational performance and its reputation, often arise from sub-tier suppliers. We recommend
41 that companies launch sustainability practices that aim to build sustainability capabilities within
42 first-tier suppliers; these should, who should, in turn, undergo changes to improve the
43 sustainability performance of their own, sub-tier, suppliers.
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48 Our study also provides implications for managers executives and sustainability (or corporate
49 social responsibility) managers who aim to extend the impact of their sustainability initiatives
50 beyond direct suppliers. We recommend that companies launch consecutive monitoring and
51 mentoring strategies in order to successfully diffuse sustainability initiatives within their supply
52 networks. Simply monitoring supplier compliance is insufficient to reaching beyond first-tier
53 suppliers, which is where sustainability risks commonly exist. In particular, we advise companies
54 to engage suppliers in interactive activities rather than simply imposing requirements on them.
55 Understanding suppliers' attitudes toward adopting the sustainability practices of their
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3 customers and, in turn, conveying these to sub-tier suppliers, is important for ensuring diffusion
4 of sustainability into a company's wider supply network. We encourage companies to engage in
5 intensive interaction to generate a positive attitude amongst suppliers and thereby open avenues
6 for major and behavioural changes that comprehensively diffuse sustainability.
7

8 9 **CONCLUSION**

10
11 Despite existing research on the strategies and practices of implementing sustainability, there
12 remains a gap in understanding *how* sustainability can be diffused beyond first-tier suppliers into
13 the wider supply network (Meqdadi *et al.*, 2017; Miemczyk *et al.*, 2012; Tachizawa and Wong,
14 2014). We adopted the IMP interaction approach (Håkansson, 1982; Håkansson and Snehota,
15 1995) as a theoretical lens to examine the impact of monitoring and mentoring strategies on
16 sustainability diffusion and how suppliers engage in these strategies.
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20 Our study evidences the extent of sustainability diffusion through implementing monitoring
21 and mentoring strategies with first-tier suppliers. The study points to the benefits of coupling the
22 two strategies to obtain better results in growing suppliers' sustainability capabilities and
23 diffusing sustainability across supply networks. We found that relying purely on a monitoring
24 strategy may prevent a company from reaping the benefits, such as potentially developing
25 sustainable products, solving pressing sustainability problems or building sustainable supply
26 networks.
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30 Our study shows that interaction between focal companies and suppliers is the backbone of
31 successfully implementing initiatives. Our findings illustrate how intensive interaction during
32 mentoring activities facilitates their diffusion in supply networks. This supports Tate *et al.*'s (2013)
33 argument that actor interconnectedness and embeddedness leads to better network diffusion of
34 environmental best practices. Thus, the mentoring strategy can induce a 'network change,' where
35 direct suppliers act as bridges, translating focal companies' sustainability requirements to other
36 supply network actors.
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39
40 Finally, we wish to highlight a few limitations of our study. We have focused on companies
41 within three different industries, but future research could consider more industries, which may
42 reveal other sustainability issues and strategies. We also suggest that more research be
43 conducted on specific practices within monitoring and mentoring, as some of these imply very
44 different levels of commitment and interaction, for example, comparing the impact of audits to
45 issuing questionnaires to suppliers or combining knowledge sharing with or without rewards on
46 diffusing sustainability to sub-tier suppliers. This would help to develop a more fine-grained
47 understanding of specific practices and their impacts. Finally, we acknowledge the limitation of
48 our study related to the accessibility of sub-tier suppliers. More insights might have been
49 developed if we had the chance to interview sub-tier suppliers. This is a practical challenge that
50 researchers will face when conducting multi-tier supply network analysis, however, this is
51 essential to capture better insights on what facilitates or hinders sustainability diffusion in supply
52 networks.
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55 **APPENDIX 1**

Companies and suppliers involved in the three case studies

Case study	Company/suppliers	Type of product/service	Relationship type and duration	# of interviews	Location
Metal's supply network	Metal sales: € Billion > 10 (size: large)	Precious metals production and recycling		5	Europe
	MS1 (size: large)	Solvents	Transactional (> 7 years)	2	Europe
	MS2 (size: medium)	Cork materials	Close (> 25 years)	2	Europe
	MS3 (size: large)	Travelling management	Close (> 7 years)	1	Europe
	MS4 (size: medium)	Mobility solutions	Close (> 5 years)	1	Europe
Pharma's supply network	Pharma sales: € Billion > 10 (size: large)	Pharmaceutical products and medical devices		5	Europe
	PS1 (size: large)	Active pharmaceutical ingredients	Partnership (> 10 years)	1	India
	PS2 (size: medium)	Active pharmaceutical ingredients	Close (> 5 years)	1	US
	PS3 (size: large)	Active pharmaceutical ingredients	Partnership (> 10 years)	1	Europe
	PS4 (size: large)	Active pharmaceutical ingredients	Transactional (> 20 years)	1	China
Coating's supply network	Coating sales: € Billion > 10 (size: large)	Painting and coating products		8	Europe
	CS1 (size: large)	Resin	Partnership (> 15 years)	1	South Korea
	CS2 (size: large)	Resin	Partnership (> 10 years)	1	Europe
	CS3 (size: large)	Resin	Transactional (> 20 years)	1	Taiwan
SA (conducted sustainability auditing to suppliers of both Metal and Pharma)		Sustainability auditing		1	Europe

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List of Tables

Table 1 Summary of strategies for engaging suppliers in sustainability

Authors	Strategy	Practices/Characteristics
Bowen <i>et al.</i> (2001)	Greening the supply process	<ul style="list-style-type: none"> ▪ Questionnaires on supplier environmental performance ▪ Environmental criterion in supplier assessment ▪ Environmental management system for supplier ▪ Rewards for environmental performance
	Product-based green supply	<ul style="list-style-type: none"> ▪ Recycling initiatives with supplier ▪ Environmental criterion is part of risk and reward ▪ Joint clean technology development
Cousins <i>et al.</i> (2004)	No Choice	<ul style="list-style-type: none"> ▪ Gather information on supplier ▪ Vendor assessment (one-way) ▪ Quality procedures (e.g. BS 7750) ▪ Performance guarantees and penalty clauses
	Enthusiasts	<ul style="list-style-type: none"> ▪ Training programmes ▪ Vendor assessment (one-way)
	Go First	<ul style="list-style-type: none"> ▪ Joint development programmes ▪ Two-way vendor assessment
		<ul style="list-style-type: none"> ▪ Training programmes ▪ Reward/incentive schemes
Geffen and Rothenberg (2000)	Partnership	<ul style="list-style-type: none"> ▪ Involvement of supplier in solving environmental issues ▪ Incentives for improving sustainability
Gimenez and Tachizawa (2012)	Assessment	<ul style="list-style-type: none"> ▪ Supplier evaluation through questionnaires
	Collaboration	<ul style="list-style-type: none"> ▪ Provide training and support to supplier
Hajmohammad and Vachon (2016)	Monitoring-based Risk Mitigation	<ul style="list-style-type: none"> ▪ Compliance with code of conduct ▪ Environmental and social criteria in supplier assessment ▪ Questionnaires on supplier environmental & social performance ▪ Supplier audit ▪ Environmental management system for supplier
	Collaboration-based Risk Mitigation	<ul style="list-style-type: none"> ▪ Joint planning sessions to improve supplier sustainability performance ▪ Joint development programmes ▪ Training programmes ▪ Visit supplier's premises to jointly improve supplier sustainability performance
Lamming and Hampson (1996)	Assessment Approach	<ul style="list-style-type: none"> ▪ Vendor questionnaires ▪ Environmental management system for supplier
	Collaborative Approach	<ul style="list-style-type: none"> ▪ Environment is a criterion in the purchasing decision ▪ Schemes to improve supplier's environmental performance
Lee and Klassen (2008)	Monitoring-based	<ul style="list-style-type: none"> ▪ Arm's-length approach ▪ Gather information on supplier's green performance ▪ Set criteria for supplier assessment
	Support-based	<ul style="list-style-type: none"> ▪ Direct interaction with supplier ▪ Jointly develop environmental solutions ▪ Training and education to supplier ▪ Encourage information sharing
Ni and Sun (2018)	Supplier assessment	<ul style="list-style-type: none"> ▪ Code of conduct ▪ Supplier audit ▪ Compliance with environmental and social standards
	Supplier collaboration	<ul style="list-style-type: none"> ▪ Direct involvement to improve sustainability ▪ Product and process design to improve sustainability
Rao and Holt (2005)	Supplier evaluation and monitoring	<ul style="list-style-type: none"> ▪ Environmental management system at supplier or accredited system (ISO 14001)
	Mentoring Role	<ul style="list-style-type: none"> ▪ Environmental awareness seminars ▪ Educational programmes ▪ Visit supplier's premises to jointly improve supplier sustainability performance ▪ Send an environmental team to train supplier on environmental issues

Seuring and Müller (2008)	Supplier Management for Risk and Performance	<ul style="list-style-type: none"> ▪ Environmental management systems at supplier (ISO 14001) ▪ Supplier self-evaluation and declaration on environment and social performance
	SSCM for Sustainable Products	<ul style="list-style-type: none"> ▪ Supplier development to achieve sustainable products ▪ Investment and training for supplier ▪ Deeper information flow in the supply chain
Shafiq <i>et al.</i> (2017)	Sustainability Monitoring	<ul style="list-style-type: none"> ▪ Audits and inspection ▪ Questionnaires on sustainability performance ▪ Verify supplier's commitment to achieving sustainability goals
	Environmental Monitoring	<ul style="list-style-type: none"> ▪ Gather information, such as publicly disclosed environmental records ▪ Questionnaires on sustainability performance ▪ Audits and inspection ▪ Compliance with code of conduct ▪ Environmental management systems at supplier (ISO 14001 and EMAS) ▪ Compliance with particular regulations
Vachon (2007); Vachon and Klassen (2006)	Environmental Collaborating	<ul style="list-style-type: none"> ▪ Devote resources to develop cooperative activities to deal with sustainability ▪ Mutual problem solving ▪ Joint planning sessions on environment ▪ Knowledge sharing on product design ▪ Workshops and seminars

Table 2 Practices of the monitoring and mentoring strategies

Strategy for supplier engagement in sustainability	Practices	References
Monitoring strategy	Request supplier to have environmental/social management systems	Bowen <i>et al.</i> (2001), Hajmohammad and Vachon (2016), Seuring and Müller (2008), Spence and Bourlakis (2009), Vachon and Klassen (2006), Zhu <i>et al.</i> (2005)
	Collect information on supplier sustainability performance	Bowen <i>et al.</i> (2001), Cousins <i>et al.</i> (2004), Holt (2004), Lee and Klassen (2008)
	Impose penalty clauses on supplier in case of non-compliance	Cousins <i>et al.</i> (2004), Rao and Holt (2005)
	Provide supplier with rewards and incentive schemes related to sustainability performance	Bowen <i>et al.</i> (2001), Cousins <i>et al.</i> (2004), Jiang (2009)
	Conduct sustainability questionnaire and surveys	Bowen <i>et al.</i> (2001), Shafiq <i>et al.</i> (2017), Tachizawa and Wong (2014)
	Conduct sustainability audits through company or third party	Awaysheh and Klassen (2010), Gimenez and Tachizawa (2012), Grimm <i>et al.</i> (2014), Jiang (2009), Ni and Sun (2018), Seuring and Müller (2008), Shafiq <i>et al.</i> (2017)
Mentoring strategy	Gather information on supplier through supplier self-evaluation	Harms <i>et al.</i> (2012), Seuring and Müller (2008), Spence and Bourlakis (2009)
	Ask supplier to comply with code of conduct	Awaysheh and Klassen (2010), Hajmohammad and Vachon (2016), Jiang (2009), Ni and Sun (2018), Spence and Bourlakis (2009)
	Request supplier to comply with certain regulations/standards	Grimm <i>et al.</i> (2014), Holt (2004)
	Cooperate with supplier to jointly develop sustainability solutions	Bowen <i>et al.</i> (2001), Cousins <i>et al.</i> (2004), Geffen and Rothenberg (2000), Lee and Klassen (2008), Zhu <i>et al.</i> (2005)
	Partner with supplier for improving sustainability development programmes for supplier	Geffen and Rothenberg (2000), Spence and Bourlakis (2009) Grimm <i>et al.</i> (2014)
	Conduct joint planning sessions on sustainability	Vachon and Klassen (2006), Hajmohammad and Vachon (2016)
Share sustainability knowledge and information with supplier	Geffen and Rothenberg (2000), Holt (2004), Rao and Holt (2005), Seuring and Müller (2008), Tachizawa and Wong (2014)	
Provide training, education and awareness seminars to supplier	Cousins <i>et al.</i> (2004), Grimm <i>et al.</i> (2014), Hajmohammad and Vachon (2016), Harms <i>et al.</i> (2012), Rao and Holt (2005), Tachizawa and Wong (2014)	

Guide supplier in setting up sustainability management system

Rao and Holt (2005)

Table 3 Focal Firms' monitoring and mentoring strategies and suppliers' engagement

Metal Strategy	Focal firm practices	Focal firm's practices adopted by first-tier suppliers				Practices implemented at second-tier suppliers by first-tier suppliers			
		MS1	MS2	MS3	MS4				
Monitoring	Sustainability reporting	√	√	√	√	No involvement of second-tier suppliers			
	Sustainable procurement charter	√	√	√	√	No involvement of second-tier suppliers			
	Sustainability auditing by third party	√	√	--	--	No involvement of second-tier suppliers			
Changes at Supplier		MS1 and MS2: built sustainability management systems MS1, MS2, MS3 and MS4: minor amendment in HSE procedures and CO ₂ emissions reporting							
Pharma Strategies	Focal firm practices	Focal firm's practices adopted by first-tier suppliers				Practices implemented at second-tier suppliers by first-tier suppliers			
		PS1	PS2	PS3	PS4	PS1 second-tier supplier	PS2 second-tier supplier	PS3 second-tier supplier	PS4 second-tier supplier
Monitoring	Sustainability reporting	√	√	√	√	√	√	√	--
	Management system for sustainability	√	√	√	√	√	√	√	--
	Sustainability questionnaire	√	√	√	√	√	√	√	--
	Sustainability risk assessment	√	√	√	--	--	√	√	--
	Rewards for sustainability performance	√	√	√	√	--	--	--	--
	Sustainability auditing by third party	√	√	√	√	--	--	--	--
Changes at Supplier		PS1, PS2 and PS3: built sustainability management systems PS1, PS2, PS3 and PS4: sustainability reporting system and minor HSE procedures amendment							
Mentoring	On-site visit	√	√	√	--	√	--	√	--
	Sustainability conferences	√	√	√	--	√	--	--	--
	Sustainability training	√	√	√	--	√	√	--	--
	Sustainability tools	√	√	√	--	√	√	√	--
	Sustainability knowledge sharing	√	√	√	--	√	√	√	--
Changes at Supplier		PS1, PS2 and PS3: <ul style="list-style-type: none"> ▪ installed devices and respiratory systems to reduce CO₂ emissions, solvent consumption and material spillage and waste ▪ installed water purification systems ▪ provided PPEs to improve HSE conditions 							
Coating Strategies	Focal firm practices	Focal firm's practices adopted by first-tier suppliers			Practices implemented at second-tier suppliers by first-tier suppliers				
		CS1	CS2	CS3	CS1 second-tier supplier	CS2 second-tier supplier	CS3 second-tier supplier		
Monitoring	Signing code of conduct	√	√	√	--	--	--		
Changes at Supplier		No changes							
Mentoring	On-site visit	√	√	√	√	√	√		
	Sustainability conference	√	√	√	--	--	--		
	Sustainability training	√	√	√	√	√	√		
	Sustainability tools	√	√	√	√	√	√		
	Sustainability knowledge sharing	√	√	√	√	√	√		

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3	Sustainable product development	√	√	√	√	√	√
4		CS1, CS2, and CS3:					
5		▪ installed devices and systems to reduce gas emissions					
6	Changes at Supplier	▪ provided PPEs to improve HSE conditions					
7		▪ modified the chemical production process					
8		▪ modified the logistical activities (transport and storage)					
9		▪ modified production planning system					
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Table 4 Impact of monitoring and mentoring strategies on sustainability diffusion and supplier engagement across cases

Strategy	Case study	Strategy practices	Interaction level (Low – High)	Supplier response (Reactive-Proactive)	Supplier change (Minor – Major)	Sustainability diffusion
Monitoring	Metal's supply network	<ul style="list-style-type: none"> ▪ Sustainability reporting ▪ Sustainable procurement charter ▪ Sustainability auditing by third party 	Low	Reactive	Minor changes: <ul style="list-style-type: none"> ▪ Built sustainability management systems and CO₂ emission reporting ▪ Minor HSE procedures amendment 	<ul style="list-style-type: none"> ▪ <i>Impact of monitoring strategy on suppliers:</i> increased sustainability awareness and assisted in building systems for sustainability management ▪ <i>Diffusion:</i> dyadic (company–direct suppliers) ▪ No aim for reaching second-tier suppliers
	Pharma's supply network	<ul style="list-style-type: none"> ▪ Sustainability reporting ▪ Management system for sustainability ▪ Sustainability questionnaire ▪ Sustainability risk assessment ▪ Rewards for sustainability performance ▪ Sustainability auditing by third party 	Low	Reactive	Minor changes: <ul style="list-style-type: none"> ▪ Built sustainability management systems and sustainability reporting ▪ Minor HSE procedures amendment 	<ul style="list-style-type: none"> ▪ <i>Impact of monitoring strategy on suppliers:</i> increased sustainability awareness and assisted in building systems for sustainability management ▪ <i>Diffusion:</i> dyadic (company–direct suppliers) when not coupled with mentoring activities
	Coating's supply network	<ul style="list-style-type: none"> ▪ Signing code of conduct 	Low	Reactive	No change	<ul style="list-style-type: none"> ▪ <i>Impact of monitoring strategy on suppliers:</i> increased sustainability awareness ▪ <i>Diffusion:</i> dyadic (company–direct suppliers)
Mentoring	Pharma supply network	<ul style="list-style-type: none"> ▪ On-site visit ▪ Sustainability conferences ▪ Sustainability training ▪ Sustainability tools ▪ Sustainability knowledge sharing 	High	Proactive	Major changes: <ul style="list-style-type: none"> ▪ Installed devices and respiratory systems to reduce CO₂ emissions, solvent consumption and material spillage and waste ▪ Installed water purification systems ▪ Provided PPEs to improve HSE conditions ▪ Adopted sustainability knowledge of focal firm 	<ul style="list-style-type: none"> ▪ <i>Impact of mentoring strategy on suppliers:</i> built sustainability capabilities and knowledge ▪ <i>Diffusion:</i> supply network (company–direct suppliers–second-tier suppliers) ▪ Active use of both monitoring and mentoring
	Coating supply network	<ul style="list-style-type: none"> ▪ On-site visit ▪ Sustainability conference and training ▪ Sustainability tools ▪ Sustainability knowledge sharing ▪ Sustainable product development 	High	Proactive	Major changes: <ul style="list-style-type: none"> ▪ Installed devices and systems to reduce gas emission, provided PPEs to improve HSE conditions, modified the chemical production process ▪ Sustainable product development ▪ Modified logistical activities (transport and storage) ▪ Modified production planning system ▪ Adopted sustainability knowledge of focal firm 	<ul style="list-style-type: none"> ▪ <i>Impact of mentoring strategy on suppliers:</i> built sustainability capabilities and knowledge ▪ <i>Diffusion:</i> supply network (company–direct suppliers–second-tier suppliers) ▪ Emphasis on mentoring, only simple monitoring practice ▪ Explicitly moved from monitoring to mentoring